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# Morris ARBORETUM BULLETIN



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V. 10  
N. 3

SEPTEMBER, 1959

VOL. 10

NUMBER 3



*Pinus Banksiana*

Published by  
The ASSOCIATES of  
THE MORRIS ARBORETUM

## THE MORRIS ARBORETUM OF THE UNIVERSITY OF PENNSYLVANIA

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The Morris Arboretum Bulletin is published quarterly at Philadelphia, Pa., by the Associates of the Morris Arboretum, Chestnut Hill, Philadelphia 18. Subscription, \$1.00 for four issues. Single copies, 30 cents. Free to Associates.

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## Arboretum Activities

### THE STAFF

Dr. H. L. Li attended the Ninth International Botanical Congress which was held in Montreal from August 19 to 29.

Dr. Patricia Allison represented the Arboretum at the Annual Meetings of the American Institute of Biological Sciences which took place at Pennsylvania State University, August 30 to September 3.

Miss Mary Milton undertook a week's collecting trip for the Arboretum late in July. She visited the Highland and Durand-Eastman Parks in Rochester, New York, where with the splendid cooperation of Mr. Don Yeager, she was able to assemble a fine series of herbarium specimens, especially of *Tilia* and *Magnolia*, as well as a col-

lection of scions for propagation. She also visited the Cornell Plantations at Ithaca, New York.

Messrs John Tonkin, John Dourley and Robert E. Pennewell participated in the Convention of the National Gardeners' Association held at the Warwick Hotel in Philadelphia, August 25 to 27.

### ROSE SOCIETY VISIT

On Friday afternoon, June 12, the Arboretum played host to the American Rose Society which held its 60th Anniversary Meeting in Philadelphia that week. Some 300 members of the Society arrived by bus and were welcomed by a Committee of our Advisory Council under the Chairmanship of Mrs. Frederic Rosengarten.

(Continued on page 51)

## Glimpses of Japanese Gardens

HUI-LIN LI

Garden-making in the Far East is essentially an art, a form of art which has no kin in the West. This garden art is close to the landscape paintings of China and Japan, generally considered as the loftiest achievement in Oriental art. The major feature of the Oriental garden is the stone work, which is, physically and spiritually, quite unrelated to the "rockery" of Western gardens. This stone work can, to some extent, be compared with the art of sculpture in the West; yet again, it is really quite different.

The garden art of the Orient has been extensively dealt with in Western literature in recent times. It has, in the past two centuries, exerted considerable influence upon garden-making in Europe and America. Since the end of the last war, its influence on Western landscaping and architecture has been even more profound.

It was therefore with considerable enthusiasm that I welcomed the opportunity to visit some historic gardens in Japan in a recent trip to that country. I have previously visited numerous classical gardens in China, including the many famous ones in Soochow, a city of ancient culture famed for its numerous old gardens, and Peking, where a number of extensive palace gardens as well as private estates are to this day preserved. My acquaintance with Japanese gardens was formerly limited to a few found in Shanghai and on Formosa, all built in recent times. The chance of visiting Japanese gardens in the indigenous state therefore enabled me to gain at first hand fuller appreciation of the garden art of the Orient.

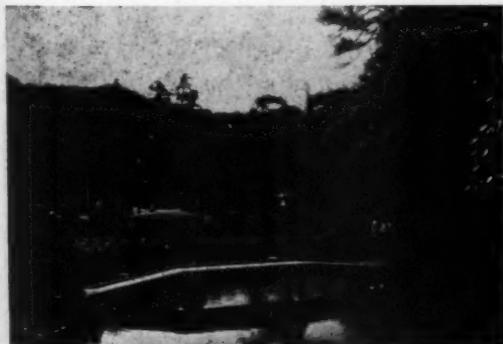


Fig. 21. The Imperial Garden of Shinjuku Palace



Fig. 22. Hamma Detached Palace

### HISTORIC INTEREST

As one keenly interested in the past, my visit to Japanese gardens was doubly fascinating due to their historic implications. There are so many classic gardens preserved intact in Japan that the evolution of the art can be studied chronologically with actual specimens. There are gardens still to be seen which originated in the Kamakura period (1186-1335 A.D.). Many of the Muromachi period (1335-1573 A.D.) and the succeeding Momoyama period (1573-1603 A.D.) are still extant in Kyoto. Of the later Edo period (1603-1868 A.D.) many additional ones can be found in Kyoto, Tokyo and elsewhere.

It is well known that the gardens of Japan stemmed originally from those of China. There are, nevertheless striking differences between the gardens of these two countries as they exist today. Thanks to Kuck's exhaustive and enlightening study of Japanese gardens,<sup>1</sup> we realize that these differences have arisen in China rather than in Japan. She points out that the art of gardening of Japan, not only in the beginning but right down through the centuries, has reflected that of China. "The naturalistic gardens still found in Japan were also those of China up to the Ming period." Since that time, gardens in China, following the decline of landscape painting, began to develop strong differences. While in China, no pre-Ming gardens seem to have survived, there still remain in Japan many gardens which date from the earlier periods.

<sup>1</sup> Kuck, Loraine E. *The Art of Japanese Gardens*. John Day, New York, 1940.

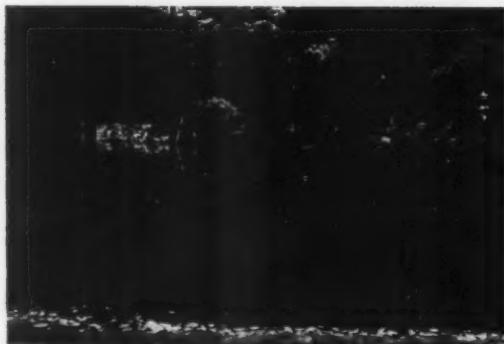


Fig. 23. Imperial Palace Garden, Kyoto

Much remains to be done in elucidating the history of Chinese gardens. The first book on garden-making in all countries, *Yuan Yi* by Chi Ch'eng of the Ming dynasty, was published toward the end of the 16th century and was written in an archaic style. This work is in need of study and analysis and a complete annotated translation into one of the western languages is highly desirable. But from a study of Japanese gardens, the successive development and evolution of the art in the Far East can be studied from a vivid series of existing examples.

#### GARDENS IN TOKYO

My herbarium study at Tokyo University required me to spend most of my time in Japan in the capital city. Claimed as the most populous metropolis in the world, the big sprawling city is a noisy one bustling with activity. There are only a few public gardens and some former palaces which are now used principally as public parks. These gardens, partially or wholly landscaped in the traditional Japanese style, are so full of picnickers that one can no longer enjoy the tranquility and serenity for which Japanese gardens are designed.

The average tourist will probably first land in Tokyo. Even though his time may be limited, and he may not be able to visit Kyoto, there are several landscaped gardens that are worth seeing. The Shinjuku Palace Garden is probably the one most frequently visited. It is especially popular for the double-flowering cherries which open later than the simple forms. The ground is extensive with parts of it landscaped in the traditional Japanese style and other parts laid out in Western design. The Japanese gardens, built around several ponds, are spacious and beautifully decorated with bridges, lanterns and stone work. (Fig. 21).

Another large garden, similarly of the "stroll garden" type, is the Hamma Detached

Palace Garden, located along the River Sumida and the Tokyo Bay. Originally a villa of the Tokugawa Shogun, it is a "stroll garden" dominated by a large tidal pond. Long, many-sectioned wooden bridges connect the islands in the pond. (Fig. 22). From the hills on one side of the pond an extensive view of the garden and the surrounding regions may be had — a characteristic feature of the gardens of the Edo period.

A similar "stroll garden" is Koroku-en, the original estate of the Tokugawa family of Mito. The center of composition is also a large pond, with surrounding hills, trees and other natural features. The garden was built in the early Edo period. Strong Chinese influence is evident in the design. The construction was first started by Tokugawa Mitsukuni, one of the most famous of the Mitos, who took a deep interest in things Chinese and helped Chu Shun Shui (pronounced as Shu Shun Sui in Japanese), the learned refugee scholar from China. The latter fled the Ching invaders toward the end of the Ming dynasty and lived many years until his death under Mitsukuni's patronage.

In Tokyo, as in most other cities in Japan, the observer can enjoy seeing Japanese gardens nearly everywhere. In parks and other gardens, although of no great historic interest, small plots may be landscaped according to the Japanese style. There are also relics of former classical gardens in places like the campus of Tokyo University and the Koishikawa Botanical Garden. Some of the larger hotels or restaurants also have landscaped gardens. Small simple courtyards are to be found everywhere in the enclosures of private dwellings or on temple grounds.

#### GARDENS IN KYOTO

Kyoto, the ancient capital of Japan, in sharp contrast to modernized Tokyo, retains its quaint and time-honored character. There are numerous places of historic interest and everywhere



Fig. 24. Nijo Castle

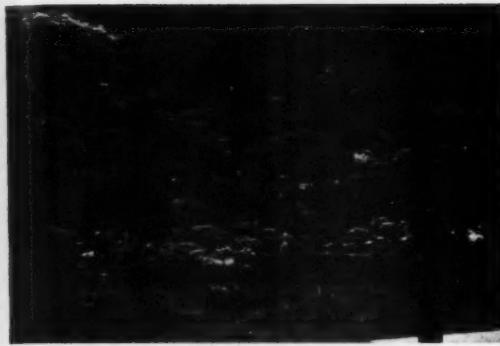


Fig. 25. Garden of the Silver Pavilion

one can encounter shrines, temples, palaces and gardens. It is a veritable tourists' mecca for both foreign visitors as well as for the native Japanese. Here, in the city as well as its environs, are found the best of all Japanese gardens.

Generally speaking there are two main types of Japanese gardens: The hill gardens and the flat gardens. The hill gardens feature one or several hills in combination with a pond and a stream. This type of garden requires a larger area, with numerous kinds of trees and shrubs planted to give the varied effects according to the season. The pond may be simple or divided into several parts and it may or may not contain one or more islets. There is often a path winding through the garden, hence the name "stroll garden."

The flat gardens are laid out on a level piece of ground. The ground usually symbolizes the surface of the water, with stones, trees or other decorations to complete the composition. This type of garden is adopted when space is at a premium. The aim of the composition is to give the feeling of spaciousness within a limited and confined area.

Both hill or flat gardens may be simple or elaborate in design. There are endless kinds of variations and all degrees of intermediates between the extremely simple and elaborate ones. The large gardens, either attached to palaces or temples, are all hill gardens. In many Buddhist temples there are also small flat gardens in walled courtyards. Many famous gardens were built by aristocratic priests of past ages. These gardens, more so than others, are designed to be places of contemplation and of spiritual communion with Nature. It was in the hands of the Zen Buddhists that the garden art was brought to its perfection. Many gardens, or certain features of the garden, also bore symbolic meanings related to Buddhism or other ancient concepts.

One type of flat garden is the tea garden, which

is usually attached to a tea-house. This type of garden, usually of small size, combines beauty with utility, as it always requires certain necessary features such as entrance gate, path, steps, water-basin, stone lanterns, etc., each to be properly placed. However, as in other gardens the ultimate guiding principle is still one of elegant simplicity.

#### PALACE GARDENS

In describing Kyoto's gardens, although not in their chronological order, one may begin with the larger palace gardens. The garden of the Imperial Palace was reconstructed after a fire about one hundred years ago. It is dominated by a large pond. A large area between the pond and the main building is covered by white sand. The garden on the whole is elegant and dignified in its appearance. (Fig. 23).

Katsura Detached Palace, in the outskirts of Kyoto, was built some 330 years ago by the famous master of tea ceremony and garden art, Enshu Kobori. The grounds are very extensive. The most famous sight is the tea house and the stone path amid the pine trees leading to it. On one side of the path is Ama-nohashidate, a miniature copy of the famous sand beach by this name on the coast of the Japan Sea. The tea house, called Shokin-tei, meaning Pine-lute Pavilion, is so named because of the whistling sound made by the wind in the surrounding pine trees.

The garden of Shugaku-in Detached Palace also occupies a very large area on the hillside and consists of three sections at different levels connected by walks lined with low pine trees. The garden was built for Emperor Gomizunoo from about 1655 to 1659. It is carefully and beautifully designed to blend with the natural scenery in the background.

The Nijo Castle, built in the early half of the 17th century, is a grandiose structure surrounded by a wall with landscaped grounds. (Fig. 24).



Fig. 26. Garden of the Moss Temple

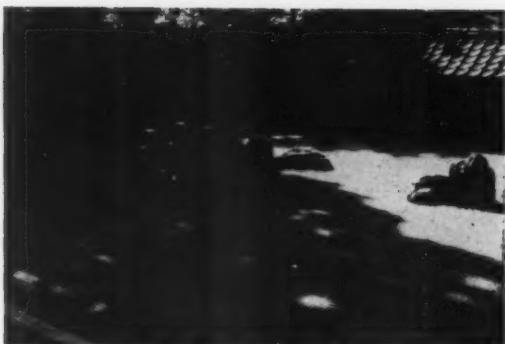


Fig. 27. Stone Garden of Ryoanji

The interior of the main building, with many colorful paintings and murals on the walls and the sliding panels, is most interesting. The garden is also of the "stroll" type, with winding paths around the main pond. There are three small islets in the pond with distinctive and imposing rock work surrounding the pond, suggestive of aggressiveness and powerfulness and in harmony with the castle architecture.

#### GOLDEN AND SILVER PAVILIONS

Two famous gardens, each dominated by a building, are commonly known as the Golden and Silver Pavilions. The garden of Kinkakuji, Temple of Golden Pavilion, the popular name of Rokuonji, was built in 1397 as a villa by Yoshimitsu, the third Ashikago Shogun. The golden colored pavilion, situated by the edge of the large pond, is a gorgeous wooden structure of three stories, and forms the focal point of the garden. It is also the best point from which to view the entire garden. The original building was destroyed by fire in 1950, and the present structure in an exact replica constructed on the same spot in 1955. The shining building, together with the open area of water and trees give brightness to the whole scenery. The reflection of the pavilion in the pond makes a very beautiful sight.

The garden of Ginkakuji, Temple of Silver Pavilion, was built in 1482 by Yoshimasa, the eighth generation Ashikaga Shogun, as a villa, following the example of the Golden Pavilion. The garden design was patterned after the Saihoji garden now generally known as the Moss Temple. The villa was later converted into a Buddhist temple. Its main feature is the Silver Pavilion, a two storied grayish building formerly coated with silver foil. Besides the pond, hills, and stone works, two famous features are a flat area of white sand and a platform designed especially for moon-viewing. The garden is typical of the Higashiyama epoch (1481-1485), a period in which the tea ceremonial originated. (Fig. 25).

#### THE MOSS TEMPLE

The so-called Moss Temple garden, after which the garden of the Silver Pavilion is patterned, is one of the most famous and oldest gardens in Japan. It had a very early beginning and was completely rebuilt by the famous Zen Abbott Muso Kokushi, in the style of the earlier Kamakura period (late 12th to 14th centuries). The ground of the entire garden is covered with various kinds of mosses, hence the name Kokedera or Moss Temple, as it is popularly known.

The whole garden is the finest expression of the beauty of curves and contours. The ponds, in the shape of the Chinese character Hsin "Heart", are separated by peninsulas, islands, or mere rocks, and connected by bridges, walks and steps, where a visitor can stroll around. There is also an upper part of the garden higher up on a mountain slope which is composed of dry stone work.

The whole garden is thickly carpeted with mosses, which give a distinctly pleasant feeling of languidness with their soft velvety yellowish green. The view of this garden with sunlight filtering through the trees onto the mossy green floor is a memorable sight. (Fig. 26).

Incidentally, it seems that nobody knows exactly how many kinds of mosses are grown there. The number given in various guide books differs from 20 to 200. The guide map says that there are over 100 kinds, and that they are at their best from May to June. On the entrance ticket, the number is given as about 120.

#### THE STONE GARDEN

Another world famous garden is the Stone Garden of Ryoanji. The temple Ryoanji is situated along the foot of scenic Mount Kinugasa, and was founded in 1450. Inside the main gate of the compound is a large pond, with two islets, bridges, scattered stones, and other features. After entering into the temple buildings, one beholds

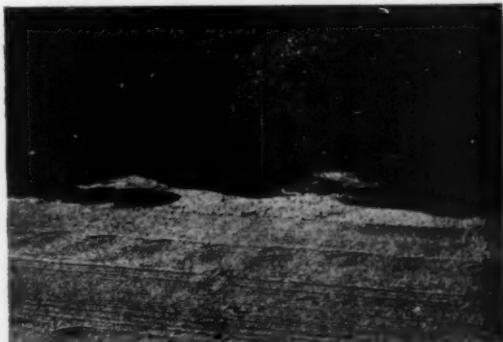


Fig. 28. Garden of Daitokuji

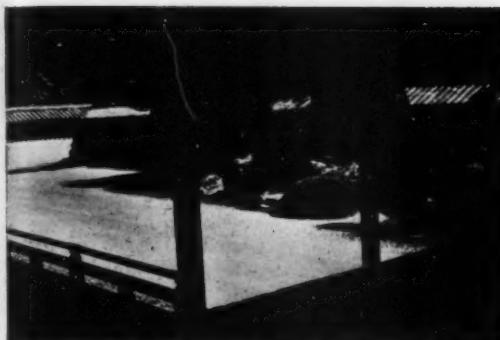


Fig. 29. Courtyard garden of Nanzenji

in a rectangular courtyard in front of the priest's chamber, the renowned Stone Garden. The yard is enclosed by low dark walls made of oil and mud. The ground is completely flat, with carefully raked fine white gravel spreading over the whole area to signify the surface of a calm sea. There are no trees or plants other than patches of mosses surrounding five groups of stones signifying the five sacred mountains of China or the five sacred cathedrals of the Zen Sect of Buddhism. (Fig. 27).

The five groups of stones are composed, from east to west, of 5, 2, 3, 2, and 3 pieces respectively. They suggest cliff islands. Two of the stones are said to resemble a mother tiger leading her cub swimming. The garden is the ultimate of symbolism in stone gardens. And yet, it is also a masterpiece of art creation as the arrangement of the stones is so well-balanced that no slightest alteration is possible. It is surprising that this artificial beauty can give to the viewer such a feeling of calm and serenity, as attested by the many visitors sitting quietly on the porch. The garden is the best example of the "dry landscape" type, perfected in the Momoyama period out of tea ceremonies and contemplative Zen Buddhism.

#### SOME FAMOUS LEVEL GARDENS

The Stone Garden and other courtyard gardens are small gardens in a walled-in area designed mainly for viewing from the porch of adjoining buildings and not for strolling. The garden of Daitokuji is a small flat courtyard garden typical of the Zen temple gardens of the Muromachi period. Fine white gravel covers the entire ground and a few stones and some trees are placed toward one corner along the wall further from the building. A pair of white stones in the corner simulates a waterfall. Viewed from one end of the porch, one can see the entire garden as well as the distant mountains which merge together completely. (Fig. 28).

Another classical level garden, said to be the model of dry garden of Zen Buddhists, is the courtyard garden of Nanzenji temple. The garden was built in the Edo period. The ground is also covered with fine white gravel and huge boulders are laid with trees close to the wall. The arrangement here is even more simple and more pleasing. (Fig. 29).

In another part of the compound of the Nanzenji monastery is the garden of Konchi-in, an elaborate dry level garden laid out between a grove of trees and a flat area of white sand in front of a building. The rock work simulates a series of islands rising above the surface of the sea. It is known as the garden of crane and tortoise because two of the rocks suggest the islands of tsuru (crane) and kame (tortoise).

#### OTHER NOTABLE HILL GARDENS

The garden of Nishi-Honganji is dominated by a large pond with elaborate stone work toward one end. (Fig. 30). In the same temple, there is also a courtyard garden, Kokei, with complicated massive stone work and bridges. Kokei, meaning Tiger Glen, is a name derived from Chinese literature, a locality in the Lushan Mountain.

The garden of Samboin, located on the grounds of Daigoji temple east of Kyoto, was started in 1598 by the famous hero-dictator Hideyoshi. The design is very elaborate, with many ponds and hills, adorned with islets and bridges. The stone work is considered the most magnificent of the Momoyama period. It is said that over 700 rocks and several thousand trees, assembled from all over the country were used. The whole garden is designed to be viewed from the several continuous buildings adjoining, unfolding in front of the viewer as he proceeds, like a traditional painting of hand scroll. (Fig. 31).

The garden of Tenryuji, built in the Kamakura period, is the leading garden of the Zen



Fig. 30. Garden of Nishi-Honganji



Fig. 31. Garden of Samboin



Fig. 32. Garden of Chishaku-in

style. The garden is dominated by a pond in the center, with scattered stones in the pond and a waterfall and stone bridge, in a pattern more or less characteristic of the period. The design is under strong influence of the bold landscape of Sung and Yuan dynasties. It is supposed to have been built by the famous Abbott Muso Kokushi some 600 years ago, who was also credited with building the garden of the Moss Temple.

The garden of Chishaku-in is made up mainly by an elongated pond along the base of the mountain Higashiyama. Stone work surrounds the pond and extends up hill to some heights, more or less densely intermixed with plantings of trees and shrubs. There are also bridges of simple artistic shapes. The garden is chiefly designed to be viewed from different parts of the adjoining buildings. (Fig. 32).

#### IN RETROSPECT

After seeing the historic gardens of Japan, I am inclined to agree with the thesis made by Kuck, that the gardens of China and Japan, up to the Ming dynasty, were essentially similar and that their present differences have been brought about in China since that time. One can vividly sense, from the classical Japanese gardens, their

closeness to landscape painting of Sung and Yuan China. The marked characteristic of both is the simplicity in their design, which is balanced, harmonious and yet elegant.

Toward the end of Yuan and the beginning of the Ming dynasties, Chinese landscape painting went into a gradual decline. The painters made a point of copying and imitating past masters, and no longer sought inspiration from nature. The paintings became conventionalized and pedantic, lacking the vitality and originality of the earlier masters. Following this trend, gardening also degenerated, becoming increasingly cluttered and over-elaborated.

It is thus refreshing to see the classical gardens of Japan, as one would expect to see Chinese gardens at their best in earlier ages. Much of the scenery in these gardens reminds one of a simple, bold sketch of a few stones and bamboos or pines by such Yuan masters as Ni Tsan or Wang Meng. From these Japanese gardens, it is clear that as an art form, they are closely akin to Oriental landscape painting. Both are aimed at re-creating a suggestion of nature. To make a garden is to create a serious work of art, a work that is esthetically satisfying to both the creator and the viewer.

# Hard Pines Cultivated in the Philadelphia Area

JONATHAN W. WRIGHT AND FRANK S. SANTAMOUR, JR.

(Continued from page 29)

## JAPANESE RED PINE (*P. densiflora* Sieb. & Zucc.)

Japanese red pine is native in the principal Japanese islands, Korea, Manchuria, and southeastern Siberia. Most of the natural forests occur between 300 and 3,000 feet in elevation. However, it occasionally grows near sea level or as high as 7,000 feet. Unlike the Japanese black pine it is not resistant to salt spray and is not found close to the shore.

In its native habitat this species grows in pure stands. Or it may be found in mixed stands similar in general appearance to some of our Pennsylvania forests. Its common associates include Japanese black pine, Japanese silver fir, the two Japanese cypresses, alder, cherry, oak, chestnut, magnolia, ash, and *Zelkova*. It is the most massive of Japanese conifers, growing to a height of 120 feet and to a diameter of 7 feet.

Most Philadelphia arboreta contain specimens of Japanese red pine. It is also seen occasionally in private gardens. At a distance it is frequently mistaken for Scotch pine because of the similarity in bark color. However, the two species can easily be distinguished because Japanese red pine has longer, finer, and greener needles.

Most older specimens in this area have crooked stems and flattopped crowns. As in the Japanese black pine, this poor form is believed to be associated with transplanting damage. Natural reproduction surrounding planted trees is usually straight-stemmed and fine-branched. Several years ago we obtained permission to transplant a few natural seedlings from Andorra Nursery to the Morris Arboretum. The ones which we moved are still more or less shrubby. The ones which we left continued to grow at the rate of 2 to 2½ feet per year and (before they were destroyed for a housing development) were over 20 feet tall, had single, straight stems, and had branches less than ½ inch in diameter.

The Japanese umbrella pine (*P. densiflora* var. *umbraculifera* Mayr) is a slow-growing, much-branched cultivar which is admired because of its picturesque trunk form and umbrella-shaped crown. The oldest specimens in the city are in the Morris Arboretum's Japanese

Garden I and are responsible for much of the charm of that garden. This cultivar is usually propagated by grafting but can be grown from seed collected from a group of the umbrella-shaped trees which inter-pollinate each other. (Fig. 18).

In the late 1930's Dr. E. J. Schreiner of the Northeastern Forest Experiment Station produced the first hybrids between Japanese red and Scotch pines. These have grown very rapidly in their permanent test locations in northern Pennsylvania and Maryland. They also coned at an early age and produced promising  $F_2$  and backcross progeny which are now under test near Philadelphia. Japanese red pine is also a promising parent in combination with other members of the SYLVESTRES.

## CHINESE PINE (*P. tabulaeformis* Carr.)

Chinese pine is a wide-ranging species native in the mountains of western China. This species is variable and may ultimately be found to contain as much genetic diversity as Scotch or ponderosa pine. It has not been the subject of a thorough seed origin study but trees from the southern part of the natural range are supposed to grow faster and straighter than trees from farther north.

The three old Chinese pines growing in the Morris Arboretum are similar to each other and appear to have been grown from a single seedlot. Each has a flat, table-topped crown justifying the specific epithet *tabulaeformis*. (Fig. 19). In fact the crowns are so flat that we used to sit on rather than in the tree tops when performing pollinations.

The two specimens in the arboretum of Westtown School are very different from each other and from the Morris Arboretum trees. Each has a single, straight stem and continues to grow upward at the rate of nearly 2 feet per year. One has yellow male catkins and fine needles; the other has red male catkins and coarse needles.

This species hybridizes readily with Japanese black pine but the hybrids have relatively little promise. Even those tree  $\times$  tree combinations involving the Westtown parents grew slightly slower than pure *P. Thunbergii*.

#### MASSON PINE

(*P. Massoniana* Lamb.)

This is a native of southeastern China. In spite of the fact that it has an extensive natural range and is an important timber tree in its native country it is little known to western botanists. Judging from the climatic conditions prevailing within its native habitat Masson pine should not be hardy within our area. For that reason we reserve judgment as to the authenticity of the specimens now growing in the Morris Arboretum. (Fig. 20). They certainly have some *P. Massoniana* characters and germplasm but may be natural hybrids with some other species growing in the same oriental botanic garden from which the seed was received. They are similar in several respects to Japanese red pine but differ from that species in having longer and yellower needles and a denser crown.

#### YUNNAN PINE

(*P. yunnanensis* Franchet)

This is the only 3-needled member of the SYLVESTRES. It is a native of Yunnan and other warm parts of western China. The single Morris Arboretum specimen was grown from seed obtained from a botanical garden, and may possibly be a hybrid.

Several years ago we obtained pollen of pure *P. yunnanensis* from the Institute of Forest Genetics in Placerville, California. With this pollen we produced a number of *P. Thunbergii*  $\times$  *P. yunnanensis* hybrids. These were easily distinguishable from non-hybrids by exceptionally rapid growth, three needles per bundle, and needle length (longer than in pure *P. Thunbergii*). Several of these hybrids are under test in the Morris Arboretum, in the grounds of the Flower Observatory near Paoli, and in Washington Crossing State Park, New Jersey.

#### SERIES AUSTRALES

AUSTRALES is a New World series composed of five southeastern and nine or more western and Mexican species. It might be considered as two separate series. The southeastern species have similar ranges, are primarily multinodal, produce relatively dense wood, and cross easily with each other but not with the western species. On the other hand most of the western members of the series are uninodal and produce relatively soft wood.

Philadelphia is near the northern extremity of the range of the eastern AUSTRALES. We can expect to make relatively large use of the two hardest species — shortleaf and loblolly pines — but probably will never grow the less

hardy ones except as curiosities.

The western United States members of the series which have been tested here appear to have considerable promise. They have been hardy, have grown moderately rapidly, and have had as good timber form as some of our native species. Their full potentialities can only be guessed at. Future plantings will contain better seed origins than have been used in the past. They may also contain some of the species hybrids which have grown so well in California trials.

#### SHORTLEAF PINE

(*P. echinata* Mill.)

The natural range of shortleaf pine extends from Long Island and southern Pennsylvania south to northern Florida, and west to southwestern Illinois, Missouri, and eastern Texas. In large parts of this range it forms extensive forests and is an important timber and pulpwood species. It is a very important component of New Jersey's pine forests.

At present this species is considered as belonging to the series AUSTRALES. Perhaps it might better be grouped with the pitch pine for the two hybridize easily and are similar in many respects. For example, both sprout from the base when cut and bear leafy twigs along the trunk (these characteristics are more pronounced in pitch than in shortleaf pine). The shortleaf



Fig. 33. Longleaf pine, *Pinus palustris*

pine generally has a straighter trunk and finer branches than does the pitch pine.

The few trees of this species in Philadelphia have been planted in arboreta. They are relatively slow-growing and open-crowned, and are without particular horticultural merit.

#### LOBLOLLY PINE

(*P. Taeda* L.)

This is a native of the Coastal Plain and Piedmont from Cape May, New Jersey south to central Florida and west to eastern Texas. Its natural range also extends northward along the Mississippi Valley to Arkansas and Tennessee. Because of its rapid growth and good form it is an important timber tree in most of its range. Forest plantings in central New Jersey indicate that its commercial range may be extended into this area for in these plantings it grew faster and has smaller branches than the native species.

The few loblolly pines planted in Philadelphia arboreta are very fast-growing and have relatively long needles, fine branches and narrow crowns. This species should find considerable horticultural use in situations where large, straight evergreens with moderately dense foliage are desired.

Loblolly pine seedlings grow much faster than do seedlings of northern conifers. At the end of their first year they are frequently 8 or 10 inches tall and by the end of their second year they may be 2 or 3 feet tall. Because of this rapid growth they should be placed in their permanent locations at the start of the second growing season.

#### LONGLEAF PINE

(*P. palustris* Mill.)

Longleaf pine, so named because its needles are sometimes 18 inches long, is a native tree of the Coastal Plain from southeastern Virginia to Texas. Almost everywhere within its range it is an important tree, producing large quantities of lumber, pulpwood, resin, and turpentine. The fleshy roots of its seedlings also furnish hog food but this is a feature that foresters do not appreciate.

The single Morris Arboretum specimen (perhaps the only one north of Virginia) has been unexpectedly hardy. In some winters it has suffered a little leaf-browning but each spring it has promptly recovered. It has produced very few side branches and has grown more slowly than it would have in the South but is nevertheless easily recognizable by anyone acquainted with the species. (Fig. 33).

The seedling growth pattern is different from that in any northern species. Under natural conditions the seedling may make negligible height



Fig. 34. Ponderosa pine, *Pinus ponderosa*

growth for a long period and may remain in this "grass" stage up to 15 years. Prescribed burning and removal of competing vegetation may sometimes induce normal height growth.

#### SLASH PINE

(*P. Elliottii* Engelm. var. *Elliottii*)

The natural range of slash pine is confined to the Coastal Plain from southeastern South Carolina to eastern Louisiana. In central and southern Florida it is replaced by the South Florida slash pine, *P. Elliottii* var. *densa* Little & Dorman. It is the fastest growing of all the southern pines and for that reason is planted extensively within its natural range. It is also being planted in large numbers in Queensland and other moist parts of the southern hemisphere.

The single specimen at the Morris Arboretum has done well to remain alive for 19 years under adverse shading conditions. It has certainly not shown any of the rapidity of growth for which it is so well known.

#### MONTEREY PINE

(*P. radiata* D. Don)

The principal area of distribution of this species is in the Rocky, Cascade, and Sierra Nevada Mountains from Canada to northern Mexico, but there are outlying populations as

far east as the Dakotas and Nebraska. Over large areas of this range it forms extensive pure stands which contain little or no undergrowth and look like well-kept parks. This is the largest of the hard pines, attaining a maximum height of 230 feet and a maximum diameter of 8 feet.

Ponderosa pine is a variable species. Three geographic varieties — *P. ponderosa* var. *arizonica* (Engelm.) Shaw of southern Arizona and New Mexico, *P. ponderosa* var. *scopulorum* Engelm. of Utah, eastern Nevada, and western Colorado; and *P. ponderosa* var. *ponderosa* — are commonly recognized. In addition there are several races which have not been given Latin names. We do not have origin data for any Philadelphia trees, so cannot say whether they are the best available in the species. (Fig. 34).

The tallest ponderosa pines within the Philadelphia area are found on the campus of Haverford College. They are healthy and full-crowned and have grown about 1 foot in height per year. They are similar to Austrian pine in general appearance but are distinguishable from that species by their longer needles and armed cones.

Although ponderosa pine is a native of dry sites in the West some of the thriftiest specimens in the Philadelphia area are growing on very poorly drained soils near Center Square. They were planted there about 10 years ago and have exhibited no signs of poor growth due to inadequate soil aeration.

#### JEFFREY PINE (*P. Jeffreyi* Grev. & Balf.)

Jeffrey pine is a native of the Sierra Nevada and a few other high mountain ranges from southern Oregon to northern Baja California. It typically grows at higher elevations than does the ponderosa pine. Like that species, it attains large sizes (up to 200 feet tall) and usually grows in open stands with little underbrush.

This species is similar to ponderosa pine in general appearance and has been treated as a variety or mere ecological variant of the latter in some manuals. However, recent work at the Institute of Forest Genetics in Placerville, California has shown that the two are without a doubt distinct enough to be considered as separate species. In fact that work showed that the Jeffrey and Coulter pines are more closely related than are Jeffrey and ponderosa. Not only do the Jeffrey and Coulter pines cross readily but they contain a substance, heptane (an ingredient of gasoline) not found in any other hard pines (Mirov, 1946).

The few Jeffrey pines found in Philadelphia are healthy, but are open-crowned and slow-



Fig. 35. Apache pine, *Pinus Engelmannii*

growing. Certainly they are far different in appearance from native trees or from plantings in southern Michigan and southern Illinois. In the latter two places this species has attained heights of about 50 feet and appears capable of becoming an important timber tree.

#### APACHE PINE (*P. Engelmannii* Carr.)

The Apache pine is a little known species from the high mountains of southern Arizona and New Mexico and from northern Mexico. It has been considered by many to be merely a geographic variety of ponderosa pine, which it resembles in most respects. However, it merits recognition as a separate species, if for no other reason than the fact that its seedlings pass through a fleshy-rooted "grass" stage in which there is little leader elongation for several years. That stage is not present in ponderosa pine. (Fig. 35).

The circumstances surrounding this species' introduction into the Philadelphia area are almost unbelievable to any one accustomed to planting trees in the spring. Mr. A. L. Baily, Jr., who was then in charge of the arboretum at Westtown School vacationed in Arizona in August. While there he dug wildlings and shipped them — barerooted — to Philadelphia by express. They were promptly planted upon arrival and have thrived ever since. One is now growing at the rate of 1.8 feet per year.

#### SERIES INSIGNES

The series INSIGNES is a catch-all including species of widely diverse origins and habits of growth. Of most interest to us in Philadelphia is a group of six species from eastern and northern United States. These are the familiar jack, Virginia, pitch, pond, Table-Mountain, and lodgepole pines. They are all rather limby trees that develop wide, spreading crowns and produce knotty lumber unless they are carefully tended. However, they are of great importance within the region if not within the city because (with the exception of pond pine) they are capable of growing on dry, sterile soils for which better species are not adapted. The sand pine of the Gulf Coast is a seventh member of this group, but is probably not hardy within our area.

The California closed-cone pines (Monterey, knobcone, bishop, and Santa Cruz Island, *P. remorata* Mason) form another natural group within the series. These are of great theoretical interest because their evolutionary history is well known and because one of them (Monterey pine) has been planted on hundreds of thousands of acres in the southern hemisphere. However, except for knobcone pine which has survived here for several years, these California species will probably not prove hardy.

Thirdly there is a group of four species from warm-temperate or sub-tropical parts of Mexico. Like the California closed-cone pines, these Mexican trees are probably only of academic importance to Pennsylvanians.

Last is a group of two south European species. One of them, cluster pine, has proved unexpectedly hardy and will probably be a valuable ornamental or forest tree. The other, Aleppo pine, has been tested in Philadelphia but died the first winter.

#### JACK PINE

(*P. Banksiana* Lamb.)

Although a comparative stranger in the Philadelphia area this is one of the most common eastern American pines. Its natural range extends from New Brunswick south to northern Pennsylvania, west to Minnesota, and northward across Canada nearly to Alaska. It is typically a small, branched tree growing only 50 or 60 feet tall and 1 to 2 feet in diameter. However, it can have good timber form if it is severely crowded. In spite of its deficiencies it is a very important timber and pulpwood tree in the northeastern United States and Canada because it occupies hundreds of thousands of acres of dry, sterile soils on which other trees do not thrive.

Most jack pines within Philadelphia are found

in arboreta. They are broad-crowned and have large branches. Their foliage is usually rather sparse and they are without particular horticultural merit. (Fig. 36).

Limited numbers of young jack pine are marketed at Christmas time as "Bank pine" or "golden Banks pine". Even with those fancy names they have not made much of an inroad on the Christmas tree market because their crowns are not as full as most people desire.

#### LODGEPOLE PINE

(*P. contorta* Loud.)

This is the western counterpart of the jack pine. Like the latter species it can grow well on rather poor soils, holds its unopened cones until they are opened by heat, and comes in extensively after forest fires. It is a wide-ranging and variable species consisting of four easily recognizable subspecies: ssp. *latifolia* of the American and Canadian Rockies; ssp. *murrayana* of the Sierra Nevada and Cascade Mountains from California to British Columbia; ssp. *contorta* of the coastal mountains from California to Alaska; and ssp. *bolanderi* of the plains back of Cape Mendocino in California. Those subspecies vary considerably in such characteristics as needle and cone shape, growth rate, growth form, and hardiness.



Fig. 36. Jack, *Pinus Banksiana*



Fig. 37. Lodgepole pine, *Pinus contorta*

Under natural conditions lodgepole pine sometimes forms stands so dense that a man can hardly walk between the trees. The trees in such stands are spindly, 20 or 30 feet tall and only a few inches in diameter. The Indians thought them ideal for supporting tepees — hence the common name.

Lodgepole pine has been grown only as a curiosity in a few Philadelphia arboreta. The trees are thrifty in appearance but slow-growing, open-crowned, and large-branched. A great deal of this poor performance may be due to improper seed origin because there are nice-looking stands elsewhere in the East. (Fig. 37).

The lodgepole and jack pines cross readily and there is a considerable area in western Alberta in which the forest consists almost entirely of hybrids. We produced some of these hybrids in Philadelphia and found them to be intermediate between their parents in most characters.

#### VIRGINIA PINE (*P. virginiana* Mill.)

Virginia pine is a native of the eastern United States. Its natural range extends from New York south to Georgia and west to southern Indiana. It is common in New Jersey and Maryland and is occasionally seen on dry ridges along the Pennsylvania Turnpike. It can grow as tall as 90 feet but in most places reaches heights of only 50 or

60 feet. Like jack and lodgepole pines it is very branched when open-grown but produces straight-stemmed trees if grown in a dense stand. It is valuable chiefly because of its ability to grow on poor soils, and is principally used for pulpwood.

The few Philadelphia-area trees are typical of many open-grown specimens seen in the New Jersey pine barrens. They have broad crowns, large branches, short needles, and are grown chiefly as curiosities. (Fig. 38).

#### TABLE-MOUNTAIN PINE (*P. pungens* Lamb.)

Table-Mountain pine derives its common name from Table Mountain, Georgia, on which it occurs. However, it could equally well be named for its table-topped appearance because it is almost always a short, broad-crowned tree. It grows on very dry soils from New Jersey to Georgia and Tennessee but is nowhere common.

In the Philadelphia area we have seen it planted only in the three arboreta mentioned in Table 2. In all cases it has had thrifty, dark-green needles 2 to 3 inches long and a picturesque, open crown. It would form an interesting oddity in medium-sized gardens where spreading evergreens 20 to 30 feet tall were desired.

The cones of Table-Mountain pine are distinctive. They are ovoid, light brown, 2 to 3 inches long, tenaciously persistent for years after maturity, and armed with such stout spines that gloves or clippers are necessities for seed gatherers. But it is the cone arrangement which is most interesting. Even on old trees the ability to bear fruit is shared by only a few large branches and year after year the female strobili appear only at the tips of branches on which cones were borne for the previous 10 or 15 years.

#### PITCH PINE (*P. rigida* Mill.)

This is an inhabitant of dry ridges and gravelly soils from Mt. Desert Island in Maine south to Maryland in the Coastal Plain and south to northern Georgia in the Appalachians. It is one of the most common timber species in New Jersey.

This species is included with the INSIGNES because it has persistent cones. However, it does not cross with other members of the group and probably should be considered as more closely related to shortleaf and other southeastern pines. (Fig. 39).

The largest pitch pines in the Philadelphia area were recently cut for a housing development. They were located on an old farmstead near Center Square. The three veterans were between 60 and 70 feet tall and between 2 and 3

feet in diameter. They were rather coarse-branched and had crooked boles. Surrounding them to a distance of a few hundred feet was a group of natural seedlings up to 25 feet tall which were growing vigorously and bearing occasional cones. These youngsters had moderately dense crowns and were irregularly branched. They were valuable as curiosities but did not prompt people in the vicinity to plant more pitch pine for landscape purposes.

#### KNOBcone AND MONTEREY PINES

(*P. attenuata* Lemm. and *P. radiata* D. Don)

Knobcone pine is the most widespread and hardiest member of the West Coast closed-cone pine group. Its total natural range is about 1,000 miles long, and includes several scattered stands in southern Oregon and California. In its natural habitat it is a fast growing but limby tree that attains heights of only 20 or 30 feet (occasionally 100 feet). It is of little commercial importance.

Monterey pine has six small natural distribution areas scattered over a distance of about 600 miles along the coast of southern California and the islands of the California and Baja California coasts. The largest of these natural stands is only a few miles across and the smallest — on Guan-

delupe Island — consists of only a few hundred trees. In California it is regarded as a curiosity. However, it is of great commercial importance in the southern hemisphere, where over a million acres have been planted. In New Zealand it has grown 160 feet tall in 40 years. And the average per-acre yield from all 20- to 30-year-old stands cut in New South Wales during the period from 1950 to 1955 was 300 times as large as the present annual *per capita* lumber consumption in the United States.

Several years ago we were intrigued by the rapid growth of these two species and tried a few seedlings of each as well as of the hybrid between the two. They did grow rapidly — 2 to 3 feet the first year — but only one knobcone pine has survived the rigors of Philadelphia winters.

#### CLUSTER PINE

(*P. Pinaster* Ait.)

The cluster pine is a western Mediterranean species, growing naturally in southern France, Spain, Portugal, and Morocco. There it is an important timber tree and is also tapped for turpentine. It is used extensively for sand dune afforestation because of its ability to grow rapidly on deep sandy soils.

The only living specimens in the Philadelphia area are on the Morris Arboretum. They originated from seed sent to us by a South African forester who collected it from a racial test which he was conducting. Thus, they may be hybrids between different races. We have been pleasantly surprised at the performance of these trees. Coming from such a warm part of the world we did not expect them to survive more than a year or two. Yet they are now 10 years old and the only mortality has been due to girdling by labels which were not loosened in time. They have dense, dark green foliage and have been among the fastest growing trees on the Arboretum. (Fig. 40).

#### SERIES LEIOPHYLLAE

This series contains two species from Mexico and the southwestern United States. Only one has been tried in this area.

#### CHIHUAHUA PINE

(*P. leiophylla* Schiede & Deppe var.  
*chihuahuana* (Engelm.) Shaw)

The Chihuahua pine is more common in northern Mexico than in the United States, where it grows naturally in only a few localities in the mountains of southern New Mexico and Arizona. It is interesting in three respects. First, it is the only pine for which 3 rather than 2 years are required for cone development. Second, it is



Fig. 38. Virginia pine, *Pinus virginiana*

the only hard pine growing in the Philadelphia area which commonly bears needles in clusters of more than three (there are three to four needles per fascicle in Chihuahua pine). Third, it is the only hard pine growing in the Philadelphia area in which the sheaths surrounding the leaf fascicles are deciduous as in the soft pine.

The two specimens at the Westtown School arboretum were introduced several years ago by Mr. A. L. Baily, Jr., who dug them in Arizona and shipped them by express to Philadelphia during the heat of the summer. They are short-needled and open-crowned and will probably be of limited value in horticulture and forestry.

#### SERIES MACROCARPAE

Series MACROCARPAE is composed of three species, all endemic to California.

#### DIGGER PINE

(*P. Sabiniana* Dougl.)

Digger pine is a native of the dry foothills of western California and of the central Sierras, occurring at elevations of from 500 to 4,000 feet above sea level. There it is a very distinctive feature of the landscape because of its sparse, gray-green foliage and rounded crown, usually no more than 50 feet. It was named after the Digger Indians, for whom its large seeds were a source of food. The two specimens in Philadel-



Fig. 39. Pitch pine, *Pinus rigida*

phia have grown at moderate rates and have the long, gray-green needles and loose habit typical of native trees in California.

#### SOURCES OF SEED AND NURSERY STOCK

All the commercially important United States, European, and Japanese species mentioned in this paper are regularly planted by the million and for those species commercial seed of high purity and germination percent is readily available at reasonable prices. Some dealers list three or four different geographic origins for such species as Scotch pine and nearly all are willing to supply seed origin data upon request.

Specially designed seed orchards have been established for the production of elite seed of some southeastern and European species. These orchards are in the trial stage and are not yet giving seed of proven genetic superiority. Most seed from those plantings is used for experimental purposes, very little being available from ordinary commercial sources.

The Chinese hard pines are the only species for which no truly reliable sources of seed now exist. Those species grow in remote areas and were hard to collect even before the present tense world situation. The grower interested in them can only collect cones from arboretum trees and hope that the resultant seedlings are not hybrids or selfs.

Many northeastern forest and Christmas tree nurseries regularly sell 2- or 3-year-old seedlings of red, Scotch, Austrian, mountain, jack, shortleaf, pitch, loblolly, and Virginia pines. Many of these same species are also available in larger sizes from ornamental nurseryman. The Pennsylvania grower who is interested in other species usually has to contact nurseries outside the region or grow his own. The latter course is preferable because pine stock which is shipped long distances frequently suffers heavy mortality. This is especially true for the southern species because southern nurserymen have to lift their stock many weeks before we are ready to plant in the North.

#### PROPAGATION OF HARD PINES

The hard pines are most easily propagated from seed. The seed can be sowed directly in shaded, well-watered, outdoor nursery beds at a density sufficient to produce from 25 to 50 seedlings per square foot. Weed control, which used to be a major item in pine seedling production, is now easily accomplished by spraying with mineral spirits such as "Varsol". Many growers also fumigate their beds with one of the new weed-control chemicals before sowing. Some of those chemicals also control soil-borne insects and pathogens.



Fig. 40. Cluster pine, *Pinus Pinaster*

Some of the very fast-growing southern pines should be moved to their permanent locations when only one year old. Species such as Virginia and loblolly pines produce large tops in relation to their root systems and survival is much higher with naked-rooted first-year seedlings than with balled older stock.

For most northern species foresters usually use 2- or 3-year-old seedlings when establishing forest plantations. If such stock is kept moist and is planted properly in plowed strips or with a tree-planting machine, survival of 80 or 90 percent is common. Most planting is done in the spring to avoid frost heaving.

Propagation of the hard pines by cuttings is very difficult. Only if the cuttings are taken from young seedlings or consist of a single leaf bundle (such bundles usually fail to set a bud) is the rooting percentage likely to be high.

Southeastern workers have recently had very good success with pine grafts. The essentials for success in this grafting work are: (1) Use understocks which have been grown in place or which were potted up at least 6 months previously, (2)

Use ordinary good grafting techniques as recommended for fruit trees, (3) Protect the completed grafts from desiccation by means of a plastic bag or grafting case until the union is complete. (4) If the grafts are made outdoors they should be shaded by a paper bag or a lath frame until the graft union is complete, and (5) Keep the grafted plants well watered. The best time for making pine grafts is still uncertain. Many southern workers prefer the period just after growth starts, and make their grafts on the newly expanding candles. Other workers have had better success in early spring, before growth starts.

#### ACKNOWLEDGMENTS

We wish to express our thanks to the many members of the staffs of the Northeastern Forest Experiment Station and the Morris Arboretum who have cooperated in the tree breeding research carried on by the Station. Special thanks are due H. L. Li, who took some of the pictures, and to J. M. Fogg, Jr. and E. J. Schreiner.

We made liberal use of the facilities of Westtown School, Westtown, Pennsylvania, and Haverford College, Haverford, Pennsylvania in the preparation of this report. Had it not been for the excellently maintained plantings at those schools our hard pine story would have been very incomplete.

#### REFERENCES

Duffield, J. W. 1952. Relationships and species hybridization in the genus *Pinus*. *Ztschr. f. Forstgenetik* 1: 93-100.

Little, E. L. Jr. 1953. Check list of native and naturalized trees of the United States. U. S. Dept. Agric. Handbook 41. 472 pp.

Martinez, Maximino. 1948. Los pinos mexicanos. Second edition. 361 pp. Andres Botas, Mexico, D. F.

Mirov, N. T. 1946. *Pinus*: a contribution of turpentine chemistry to dendrology and forest genetics. *Jour. Forestry* 44: 13-16.

Rehder, A. 1940. Manual of cultivated trees and shrubs. 996 pp. MacMillan, New York.

Sargent, C. S. 1905. Manual of the trees of North America. 910 pp. Houghton Mifflin, New York and Boston.

Shaw, G. R. 1914. The genus *Pinus*. Arnold Arboretum Pub. 5. 96 pp.

Schütt, P. 1958. Züchtung mit Kiefern. Teil I. Individuallunterschiede und Provenienzversuche. *Mitt. der Bundesforschungsanstalt f. Forst- und Holzwirtschaft*, Reinbek bei Hamburg No. 40. 65 pp.

Weidman, R. H. 1939. Evidences of racial influence in a 25-year test of ponderosa pine. *Jour. Agric. Res.* 59: 855-888.

Wright, J. W., and Baldwin, H. I. 1957. The 1938 International Union Scotch pine provenance test in New Hampshire. *Silvae Genetica* 6: 2-14.

\_\_\_\_\_, and Gabriel, W. J. 1958. Species hybridization in the hard pines, series *Sylvestres*. *Silvae Genetica* 7: 109-115.

## Associates' Corner

### THE SUMMER SCHOOL

When Miss Lydia T. Morris left her property to the University of Pennsylvania to be maintained as an Arboretum, one of her stipulations was that an educational program should be one of its activities.

For many years the educational work of the Arboretum was largely confined to teaching classes of elementary school students and it was not until 1955 that instruction at the college level was offered. In the summer of that year Dr. Fogg, aided by members of his staff, conducted a course devoted to the study of Woody Ornamental Plants which was open to qualified graduate students. This course, now completing its fifth year, has grown in attendance from fourteen students in 1955 to twenty-eight in 1959.

Meanwhile the National Science Foundation had developed its far-flung series of Summer Institutes for High School Teachers of Science and Mathematics. The University of Pennsylvania was awarded one of these Institutes in 1957 and Dr. Fogg was appointed as its Director. The basic objective of these Institutes is to assist high school teachers to improve their knowledge of their subjects, emphasize recent advances in subject matter fields and stress present-day methods of teaching at the secondary school level, especially in the imaginative use of class room, laboratory and field techniques.

During the summer of 1959 there were 350 such institutes throughout the country with a total enrollment of approximately 20,000 teachers. Each participant was granted free tuition, a stipend of \$450, plus a travel allowance and a stipend of \$90 for each dependent up to a total of four. The far-reaching influence of this program in improving the teaching of science is indeed significant.

As operated at Pennsylvania the 1959 Summer Institute included 100 participants (selected out of over 550 applicants) distributed among eight courses of instruction. These courses embraced chemistry, physics, mathematics, and biology. Most of the instruction was given in modern laboratories on the campus, but two of the courses in biology were conducted at the Arboretum, with its superb collection of mature native and exotic trees and its wide variety of geological types and ecological conditions.

One of these was a course in General Ecology which was taught by Dr. Francis C. Evans, Ph.D. (Oxon.), Professor of Zoology at the University of Michigan, assisted by Mr. Wilfred A. Kolman, a graduate student in Zoology at the University of Pennsylvania.

Although Dr. Evans was loaned to us by Michigan for the Summer session, it was really a case of "The Return of the Native," since he was born and grew up in Germantown and his mother was a Morris.

Dr. Evans' course dealt with the flora and fauna of the fields and streams, their contrasts and interrelationships, and the maximum life capacity of the two areas. In addition to utilizing the resources of the Arboretum, field trips were taken to the Pine Barrens of New Jersey, Island Beach, Bowman's Hill and other ecologically interesting localities. Dr. E. T. Wherry, of the University of Pennsylvania, and Drs. Murray Buell and John A. Small, of Rutgers University, assisted in these trips. Specimens were collected and studied in the Morris Mansion, which also served as headquarters for daily lectures.

Dr. Fogg's course on Woody Plants was given, as in the four preceding summers, in the Gates Building with its fine library and herbarium facilities. The members of this class learned to recognize the many kinds of trees and shrubs growing in the Arboretum and also took field trips to a number of localities. Each student was enabled to assemble an herbarium of more than 500 species to be used in his own teaching or scientific work.

In addition to the instruction provided by Dr. Fogg, the class received lectures from Dr. Li on Conifers (a subject on which he is an authority), from Dr. Allison on the recognition and control of plant diseases and from Miss Milton on plant propagation.

Sixteen members of this class were high school science teachers whose attendance was made possible by the National Science Foundation. They represented several sections of the country and one of them came from the Hawaiian Islands. In addition there was, as in past years, a group of graduate students in Landscape Architecture from the University's School of Fine Arts. These students were introduced to the wealth of plant material available as elements of design. This group included students from England, Latvia and South Africa as well as this country.

One of the things I gathered from all this erudite education was that a spider is not an insect; I wonder if the spider knows that.

All joking aside, I feel we should be very proud of the fine educational work which the Arboretum is doing under Dr. Fogg's direction.

MARION W. RIVINUS

## New Associates

The Arboretum is happy to welcome the following new Associates who have been enrolled since March, 1959:

Mrs. Edward L. Altemus  
Mr. George W. Bechtel  
Mrs. Elizabeth C. Bennett  
Mrs. R. T. Blackwood  
Mr. John S. Clemens  
Mrs. Lawrence Costello  
Miss Blanche E. Davis  
Miss Charlotte E. Eastwood  
Mr. Leonard A. Falk  
Mr. and Mrs. John T. Fite, Jr.  
Mr. Logan B. Gill  
Mr. George Ayres Hewitt  
Dr. and Mrs. C. Marcus Hanna  
Mr. Norman Hardy  
Mrs. Helen D. Horsman  
Mr. Nathaniel Jacobson  
Miss Dorothy C. John  
Miss Marilyn H. Johnson  
Mr. Frederick W. Keith, Jr.

Mr. Edward Klavon  
Mrs. Stephen J. Korn  
Mrs. Elinor Lorant  
Dr. Frank C. Lutman  
Mr. and Mrs. John J. McCarron  
Vice Adm. E. R. McLean, Jr., USN ret.  
Mr. James M. Meller  
Mrs. Henry S. Miller  
Mr. R. Alexander Montgomery  
Mrs. Stanley W. Pearson, Jr.  
Mrs. Russell B. Pool  
Mr. Lonzie D. Rinker, Jr.  
Mr. Murray Shapiro  
Mrs. Walter T. Skallerup  
Mrs. Arthur R. G. Solmssen  
Mr. Charles R. Spang  
Mrs. Edwin Van Sciver  
Dr. Monroe E. Wall

## Arboretum Activities

(Continued from Page 34)

Following a visit to the Rose Garden our guests were served refreshments on the porch of the Morris Mansion.

### THE RECREATION AREA

Completing its fifth season of service to campus organizations and the community, the Recreation Area was utilized this year by 54 groups with a total attendance of more than 4600 persons. The increasing popularity of this facility is indeed gratifying.

### FROM OUR GUEST BOOK

Among the eminent botanists, horticulturists and scientists who have visited the Arboretum in recent months are the following:

Dr. W. L. Koerber, Squibb Institute for Medical Research, New Brunswick, N. J.  
Dr. Richard A. Howard, Director, Arnold Arboretum, Jamaica Plain, Mass.  
Dr. Donald Wyman, Arnold Arboretum, Jamaica Plain, Mass.

Dr. Neil Murray, Roebuck Park House, Dublin, Ireland.  
Dr. Hugh B. Loveland, Assoc. Prof. of Botany, Colgate Univ., Hamilton, N. Y.  
Dr. E. S. Rex, Rutgers College of Agric., New Brunswick, N. J.  
Dr. Robert B. Clark, Rutgers College of Agric., New Brunswick, N. J.  
Dr. Richard W. Pohl, Professor of Botany, Iowa State University, Ames, Iowa  
Dr. Wendell P. Ditmer, State Botanist, Penna. Dept. of Agric., Harrisburg, Pa.  
Dr. J. J. Christensen, Professor of Plant Pathology, University of Minnesota, Minneapolis, Minn.  
Dr. Faustino Miranda, Universidad de Mexico, Mexico, D. F.  
Dr. E. Hernandez, Escuela Nacional de Agricultura, Chapingo, Mexico.  
Dr. Cynthia Westcott, 96 Essex Ave., Glen Ridge, N. J.

J. M. F., Jr.

